

REMARKS

This Amendment is filed in response to the Office Action dated February 3, 2005.
All objections and rejections are respectfully traversed.

Claims 1-30 are in the case.

Claims 4, 24, and 26 were amended to better claim the invention.

Claims 29-30 were added to better claim the invention.

At paragraph 1 of the Office Action, the drawings were objected to because of an inconsistency between the drawings and the specification. A typographical error has been corrected in the amended drawings attached herewith, and it is believed that no new matter has been entered. The drawings are believed to be in acceptable condition.

At paragraph 2 of the Office Action, claim 4 was objected to for informalities.
Claim 4 has been amended, and is believed to be in condition for allowance.

Rejections under 35 U.S.C. §102

At paragraph 3 of the Office Action, claims 8-15, 17-19, and 22-23 were rejected under 35 U.S.C. 102(e) as being anticipated by Lyon et al., U.S. Patent No. 6,333,917, issued on December 25, 2001, hereinafter Lyon.

The present invention, as set forth in representative claim 8, comprises in part:

8. A policer based on Random Early Detection (RED), comprising:
 means for determining a moving average of a virtual time debt;
and
 means for ***determining whether a packet should be dropped based on a value of the moving average of the virtual time debt.***

Lyon discloses enhanced random early detection (RED+) systems and uses of the systems within a switching fabric and linecards. Lyon reduces the delay in notifying a transmitting source to slow its transmission rate by tagging (or dropping) a packet as it leaves the queue (on dequeue) when the system detects a congested condition, such as, e.g., when a threshold level of packets in a queue is reached. Specifically, Lyon addresses methods to select from which particular connection to the system should packets be tagged/dropped in a congested state. Lyon also discloses a connection metric where the amount of time passed since a packet was last tagged (or the average time passed based on multiple tagged packets) is measured. The bandwidth of a particular connection may also be computed as the number of untagged packets from that particular connection divided by the amount time since the last tagged packet of the system. In this way, the system in Lyon selects the particular connection from which the packets should be tagged based on how many packets the particular connection has sent in comparison to other connections.

Applicant respectfully urges that Lyon does not show Applicant's claimed novel "***determining whether a packet should be dropped based on ... the virtual time debt.***"

Applicant's claimed invention is directed toward a policer that uses ***a virtual time debt*** calculation when determining which packets to drop. By calculating the delay from the expected packet arrival time to the actual packet arrival time, it can be determined if

the system has too many packets currently travelling over the network. Lyon does not address using a virtual time debt calculation to drop packets as they flow through, but instead simply determines that a packet should be dropped based on the number of packets received (e.g., filling a queue). Lyon's AVR-TIME is the average time between tagged packets, not the time debt (delay) from an expected arrival time to the actual arrival time of a particular packet. Also, Lyon does not determine that a particular packet should be dropped based on the virtual time debt of that packet, but instead Lyon adds a tag to (or drops) the next packet to leave a queue when a congested condition is detected, not a particular packet that indicates a congested state. Lyon's calculations of the time since the last tagged packet and the number of packets received on a connection in that time is used solely to determine from which selected connection to tag a packet when the system is congested.

Applicant respectfully urges that the Lyon patent is legally precluded from anticipating the claimed invention under 35 U.S.C. § 102 because of the absence from the Lyon patent of Applicant's claimed novel "***determining whether a packet should be dropped based on ... the virtual time debt.***"

At paragraph 4 of the Office Action, claims 24-26 were rejected under 35 U.S.C. 102(e) as being anticipated by Gracon et al., U.S. Patent Application Publication No. 2002/01101134, published on August 15, 2002, hereinafter Gracon.

The present invention, as set forth in representative claim 24, comprises in part:

24. A method of policing packets in a network device, the method comprising the steps of:

determining a virtual time debt of packets flowing through the network device, *the virtual time debt computed as a delay from an expected packet arrival time established by a traffic contract to an actual packet arrival time*;

determining that packets should be dropped when the virtual time debt of the packets exceeds a predetermined value; and if so

choosing a packet to be dropped, the chosen packet in response to a random number; and

dropping the chosen packet.

Gracon discloses a system for scheduling packets in a broadband data stream. Gracon uses a policer to assign a priority to each packet received, and based on congestion levels, a congestion manager determines whether to send the packet based on the priority. Gracon detects a congestion level using standard methods, such as by monitoring the “fullness” of a queue. The policer in Gracon utilizes a theoretical arrival time (TAT) and an arrival time (Ta) to determine whether a packet is non-conforming to a specified maximum information rate (MIR). In particular, Gracon drops packets if the Ta of a packet plus a delay tolerance (L) is less than the TAT. That is, if the packet arrives sooner than it is expected, Gracon drops the packet as being transmitted at a rate greater than the MIR. Also, if the packet arrives (at Ta) later than the TAT, Gracon adjusts the TAT to equal the Ta.

Applicant respectfully urges that Gracon does not show Applicant’s claimed novel “*virtual time debt computed as a delay from an expected packet arrival time established by a traffic contract to an actual packet arrival time*.”

Applicant’s claimed invention is directed toward a policer that uses a virtual time debt calculation when determining which packets to drop, as described above. By calculating the delay from the expected packet arrival time to the actual packet arrival time, it

can be determined if the system has too many packets currently travelling over the network, in which case the delayed packet can be dropped. In other words, if a packet arrives later than it is expected, the packet has been delayed due to congestion, and should be dropped. In contrast, Gracon does not drop packets that arrive later than expected as an indication of congestion, but instead detects congestion in a typical “filled-queue” manner, and drops packets that arrive sooner than expected as packets that are non-conforming to a service agreement, i.e., are sending packets at a higher rate than allowed. Also, as evidenced by the adjustment of the TAT with the Ta of a conforming packet, Gracon, unlike Applicant’s claimed invention, appears to accept and support the slower arrival of packets.

Also, Gracon’s TAT and Ta are used to solve a different problem than Applicant. Namely, Gracon addresses the problem of a particular sender sending too many packets during a certain period of time, a threshold as specified by a service agreement (e.g., as the maximum information rate, MIR). If a packet arrives at a faster rate than is expected, it is dropped. Applicant, on the hand, addresses the problem of congested networks, where if a packet arrives at a slower rate than is expected, it has been subject to congestion, and is to be dropped.

Applicant respectfully urges that the Gracon patent is legally precluded from anticipating the claimed invention under 35 U.S.C. § 102 because of the absence from the Gracon patent of Applicant’s claimed novel “*virtual time debt computed as a delay from an expected packet arrival time established by a traffic contract to an actual packet arrival time.*”

Rejections under 35 U.S.C. §103

At paragraph 5 of the Office Action, claims 1 and 5-7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Silberschatz et al., U.S. Patent No. 6,556,578 issued on April 29, 2003, hereinafter Silberschatz, in view of Lyon.

As stated in the previous Amendment filed, Silberschatz discloses a system for managing a buffer pool containing a plurality of queues that determines when to drop a packet, and from which queue the packet should be dropped. Silberschatz determines a **global average queue occupancy**, “*avg*,” of the plurality of queues, and uses this to compute a packet dropping algorithm. If *avg* is above a maximum threshold, packets are dropped from the buffer queues, and if *avg* is above a minimum threshold, the system determines a probability for dropping packets. The system in Silberschatz can determine if one of the plurality of queues is the “offender” from which the packets should be dropped in order to lower the global average, *avg*.

Examiner also notes that “the difference between Silberschatz teaching and the limitations of claim 1, is that ... the dropping of packet is based on time variable and not the buffer occupancy.”

For the reasons set forth above with respect to representative claim 8, Applicant respectfully urges that the Silberschatz patent and the Lyon patent, either taken singly or in combination, are legally insufficient to render the presently claimed invention obvious under 35 U.S.C. § 103 because of the absence of Applicant’s claimed novel “***determining whether a packet should be dropped based on ... the virtual time debt.***”

At paragraph 6 of the Office Action, claims 2-4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Silberschatz in view of Lyon, and in further view of Fahmi et al., U.S. Patent No. 6,108,303 issued on August 22, 2000, hereinafter Fahmi. Claims 2-4 are believed to be dependent from an allowable independent claim, and therefore in condition for allowance.

At paragraph 7 of the Office Action, claims 16 and 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lyon in view of Subramaniam et al., U.S. Patent No. 6,640,302 issued on October 28, 2003, hereinafter Subramaniam.

Subramaniam only discloses electromagnetic signals. For the reasons set forth above with respect to representative claim 8, Applicant respectfully urges that the Lyon patent and the Subramaniam patent, either taken singly or in combination, are legally insufficient to render the presently claimed invention obvious under 35 U.S.C. § 103 because of the absence of Applicant's claimed novel "***determining whether a packet should be dropped based on ... the virtual time debt.***"

At paragraph 8 of the Office Action, claims 20-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lyon in view of Fahmi. Claims 20-21 are believed to be dependent from an allowable independent claim, and therefore in condition for allowance.

At paragraph 9 of the Office Action, claim 27 was rejected under 35 U.S.C. §103(a) as being unpatentable over Lyon in view of the Examiner's official notice that computer readable media may contain instructions for practicing a method.

For the reasons set forth above with respect to representative claim 8, Applicant respectfully urges that the Lyon patent is legally insufficient to render the presently claimed invention obvious under 35 U.S.C. § 103 because of the absence of Applicant's claimed novel "*determining whether a packet should be dropped based on ... the virtual time debt.*"

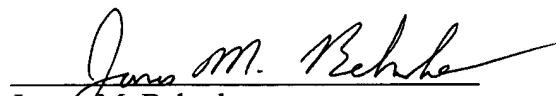
All independent claims are believed to be in condition for allowance.

All dependent claims are believed to be dependent from allowable independent claims, and therefore in condition for allowance.

Favorable action is respectfully solicited.

Please charge any additional fee occasioned by this paper to our Deposit Account No. 03-1237.

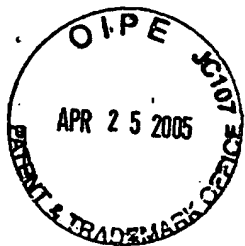
Respectfully submitted,



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IN THE DRAWING:

Please replace the originally filed Figure 4 of the drawing with the new replacement sheet for Figure 4 attached herewith. An annotated sheet showing the changes to the original figure is also attached, with the changes appearing in red ink. No new matter has been entered.



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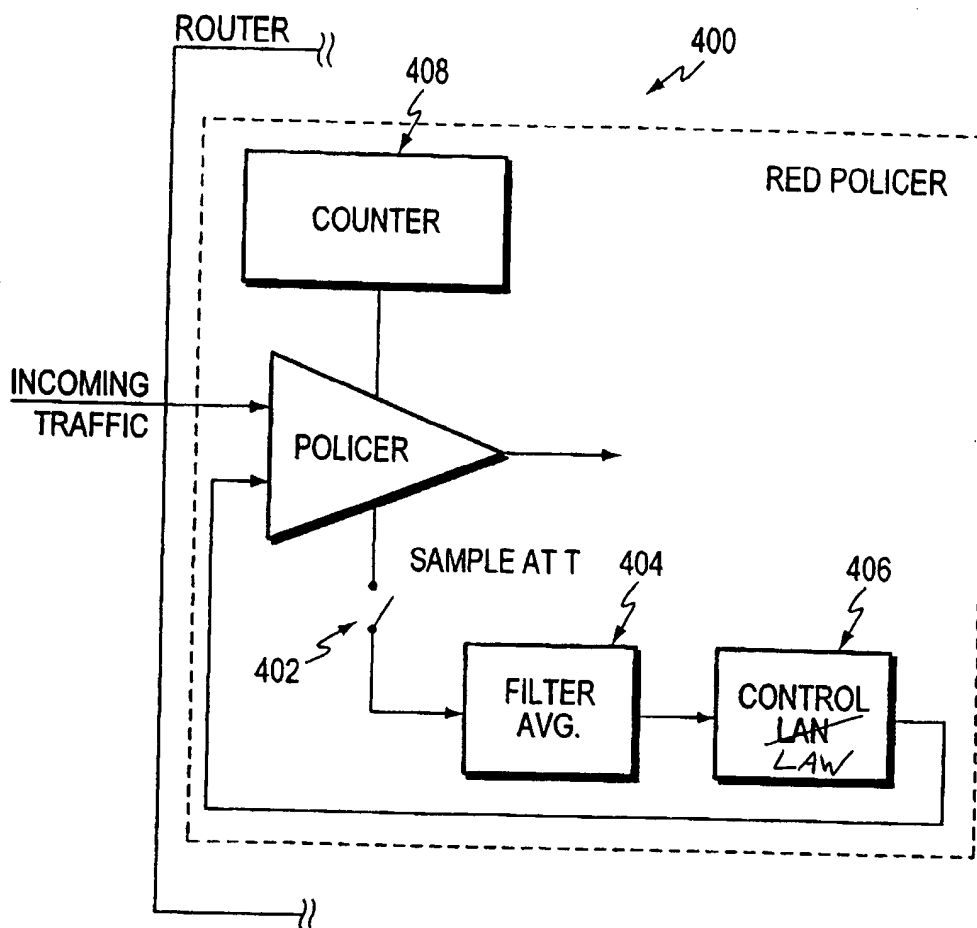


FIG. 4